

**TYPE C2A SPECIFICATION
FOR
ISOLATION VALVE FOR SL2/SL3**

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1. SCOPE

- 1.1. This specification establishes the performance, design, manufacture, testing and acceptance requirements for the Isolation Valve for the SL2/SL3 Test Cells. The valve shall be supplied complete with electric actuator. The valve shall be a butterfly type with a double or triple offset shaft design.

2. APPLICABLE DOCUMENTS

- 2.1 Government documents. Not Applicable

- 2.2 Non-Government documents. The following documents form a part of the specification to the extent specified herein.

2.2.2 American National Standards Institute (ANSI) Publications.

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| a. | B31.3 | Chemical Plant and Petroleum Refinery Piping, 1992. |
| b. | B16.5 | Pipe Flanges and Flanged Fittings, 1988 |
| c. | B16.104 | American National Standard for Control Valve Leakage |

2.2.3 National Fire Protection Association (NFPA) Standard.

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| a. | 70 | National Electrical Code, 2002. |
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2.2.4 American Society of Mechanical Engineers (ASME).

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| a. | Section VIII, Div. I | Boiler and Pressure Vessel Code |
| b. | ASME B16.5 | (1988; Errata; B16.5a) Pipe Flanges and Flanged Fittings |
| c. | ASME B16.34 | Valves – Flanged, Threaded, and Welding End |
| d. | ASME B16.47 | Large Diameter Steel Flanges |

3. REQUIREMENTS

- 3.1 Item definition. This specification covers the process air isolation valve for the SL2/SL3 duct. The valve shall be supplied with an electric actuator and other equipment as specified.

- 3.2 General. The valve shall be flanged ends matching the configuration shown in the valve data sheet. All components of the complete valve assembly, including all components of the positioning system shall be suitable for the service conditions. The valve shall be constructed in accordance with ASME BPV Section VIII, Div. I and ASME B 16.34. The valve will be installed with the shaft in the horizontal position and will transfer duct loads specified in Table 7.1. All parts of the complete valve assembly, including all components of the positioning system, shall be suitable for all conditions of operation including: operating temperature; vibration caused by valve positioning; vibration caused by air flow; as well as exterior environments of -20°F to 120°F with weather conditions including rain, snow, hail, humidity and heat. The complete assembly shall be designed and protected against operational fatigue and corrosion.
- 3.3 Standard Products. Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate components that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical, including equipment, assemblies, parts, and components. Equipment shall be supported by a service organization that is, in the opinion of the Contracting officer's Representative, reasonably convenient to the site.
- 3.4 Construction. . The valve shall be constructed as follows: End connections shall be flanged. Valve overall length shall conform to length given in valve data sheet. Flanges shall be configured to match flange shown in valve data sheet. Gaskets required to install valve shall be provided. The valve end flanges shall not be designed as composite construction (gusset/stiffeners). Each valve shall have a solid, one-piece shaft attached to the valve disc. The disc to shaft connection shall form a rigid, vibration-free assembly suitable for meeting the pressure differential, aerodynamic torque and actuator torques. Pinning, bolting and/or clamping of the disc to the shaft shall be designed for severe service with a minimum material safety factor of eight on yield for the attachment point. The shaft and the disk at the attachment point shall meet this safety factor of eight. The key / connection at the actuator shall be designed as the point of shear, or failure, so as to protect all internal components of the valve. The valve disk shall be of the double or triple offset design and capable of sealing in each direction.
- All portions of the valve exposed to the flowing fluid shall be all 300 series stainless steel construction. The valve shall include all of the manufacturer's options which will extend valve life or meantime between failure to the requirements found in the section entitled "Reliability".
- 3.5 Nameplates. Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.
- 3.6 Certificates of Compliance. Certificates of compliance shall be submitted for all components of each valve and actuator verifying the parts meets specifications.

- 3.7 Assembly drawings. Assembly drawings and material/equipment lists shall be submitted for the valve and actuator and shall consist of illustrations, schedules, performance charts, instructions, brochures, diagrams and other information associated with the equipment.
- 3.8 Spare-parts data. Spare-parts data shall be submitted for each different item of materials and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer for spare parts during one year of normal operation.
- 3.9 Reliability. The valves shall be designed for a 25-year life and shall have a mean time between failure (MTBF) of not less than 500 operating hours.
- 3.10 Maintainability. With the manufacturer's system maintenance manuals and recommended spare parts on hand, the mean time to repair (MTTR) shall not be greater than four hours for the valve. All components in the valve system shall be manufacturer's standard products with replacements readily available from commercial sources.
- 3.11 Stroke time. The maximum stroke time for the valve shall be 60 seconds.
- 3.12 Physical Characteristics.
- 3.12.1 Valves. Valves shall be in accordance with the valve data sheets in the appendix 7.1.
- a. Markings shall be prominently and permanently displayed on the valve indicating flow direction.
 - b. Lubrication. Valve bushings and bearings shall be designed so that the lubricant used cannot enter or come in contact with the flowing medium and shall also be designed so that external cooling equipment is not required.
 - c. Packing glands. All shafts extending through the valve body that cannot be sealed with pressure tight caps shall be provided with adjustable packing glands, which may be repacked externally without disassembly of any part of the valve other than the gland itself.
- 3.12.2 Electric actuators.
- a. The actuator is to consist of motor, gearing, clutchable handwheel, position limit switches, torque limit switches, grease lubricated, all contained in NEMA 4 cast housing. The actuator shall have single-cover access to all control wiring.

- b. Provide a motor which is totally enclosed, high torque design, made expressly for valve operator service and capable of operating the valve under full differential pressure as indicated on valve data sheets.
 - (1) Design motors in accordance with NEMA standards with a minimum of Class B insulation, and to be selected for operation successfully at any voltage within 10% above and below the rated voltage indicated in the schedule.
 - (2) The motor shall be provided with thermal overload protection. The enclosure shall include 120 VAC space heater.
- c. A handwheel shall be provided with manual declutching to mechanically disconnect the motor from the handwheel through the clutch assembly. The return to motor operation will be automatic when the motor is energized. The handwheel shall not rotate during motor operation. The handwheel rim pull is to be no greater than 80 lbs. for maximum design conditions.
- d. Provide power gearing consisting of heat treated helical or spur gears, carbonized and hardened alloy steel worm and alloy bronze wormgear, all grease lubricated, and designed for 100% overload, and effectively sealed against entrance of foreign matter.
- e. Provide internally adjustable, 4 position, 16 contact geared limit switches. Position limit switches and the associated gearing shall be an integral part of the valve actuator and shall be fully enclosed in a NEMA 4 rated housing. Limit switch gearing shall be driven directly from the actuator drive sleeve, remain synchronous with valve position and functional at all times, whether the unit is operated electrically or manually. Gearing shall be made of bronze or stainless steel, grease lubricated and totally enclosed to prevent dirt and foreign entry into the gear train. Switches shall be field adjustable, allowing for trip points from fully open to fully closed or any intermediate point of valve travel. They shall not be subject to breakage or slippage due to over-travel. Limit switch contacts shall be heavy duty silver or silver-plated having a minimum rating of 10 amperes(break) inductive at 120VAC, with wiping action. Contacts shall be wired to an internally-mounted terminal strip. Use of cams or set screws in securing switches on the drive system is

unacceptable. Provision shall be made for the future addition of 2 limit switches. Switch design shall permit visual verification of switch position without disassembly.

- f. The actuator shall be equipped with a double torque switch, which is responsive to loads encountered in either the opening or closing direction. Each side of the switch shall have a numbered dial and shall be adjustable. A calibrating tag shall be mounted near each switch-correlating dial setting with unit output torque. Optionally, the vendor may supply this data under separate cover, rather than attaching it to the valve. The torque switch shall operate during the complete valve cycle without the use of auxiliary relays, linkages, latches, or other devices. The torque switch shall be wired to shut off the actuator motor in the event excessive torque is being generated in either direction of travel.
- g. The actuator shall be equipped with a mechanical indicator showing the valve position in percent.
- h. The actuator shall contain no printed circuit boards.
- i. Primary power to the actuator motors shall be 480VAC, 3 phase, 60 Hz. Control power shall be 120VAC, 1 phase 60 Hz, and shall be Government furnished.
- j. The actuators shall not be furnished with the following:
 - (1) Open/stop/close pushbuttons.
 - (2) Position lights.
 - (3) Hand/off/auto switch.
 - (4) Reversing starter.
 - (5) Power transformer.
 - (6) Modulating control.
- k. Each actuator shall be furnished with a terminal strip for field wiring termination.

3.12 Environmental conditions.

- a. The valve will be located outdoors.

The ambient environment will be as outlined below:

- (1) Temperature: -20°F to + 120°F.

(2) Relative Humidity: 20% to 100%.

(3) Barometric Pressure Range: 13.7 to 14.5 psia.

3.13 Transportability. The valves shall have provisions for lifting by crane or by lift truck.

3.14 Design and construction:

3.14.1 Materials, processes, and parts: All materials, equipment and components shall be new, unused, and free from defects.

3.14.2 Valve body and seat/seal: No coating, plating, liner or internal insulation on the body or disc shall be allowed. The seal ring shall be constructed of laminated stainless steel and graphite.

3.14.3 Duty cycle: The duty cycle for the valve shall be 1000 cycles/yr. A full cycle is defined as closed-open-closed.

3.14.4 Valve disc: The valve disc shall be stainless steel material. It shall be attached to the shaft by means of pins or key splined connection. All pins, bolts, etc., which could enter the flow stream, must have a positive mechanical lock to prevent separation.

3.14.5 Valve shaft: The valve shaft shall be non-corrosive. It shall be a through shaft of one-piece construction. Two-piece shafts are not acceptable. The shaft stem shall be pinned and keyed to the disc. Roll pin connections are not acceptable. Thrust bearings shall be provided to absorb thrust in both direction and to maintain the valve disc in its proper position. All pins and bolts shall be mechanically secured to prevent entry into the flow stream.

3.14.6 Packing and bearings: Non-asbestos packing shall be used with a thermal rating required in the valve data sheets. The valves shall be designed with shaft bearings on both sides of the valve disc. Stellite bearings are not allowed.

3.14.7 Electrical: Any electrical design and construction shall conform to the requirements of NFPA 70, NEMA Standards, and UL.

3.14.8 Identification and marking: Prime and paint surfaces (except stainless steel) to preclude rust and corrosion and for general identification.

3.14.9 Workmanship: The equipment shall be constructed and finished in such a manner that no sharp edges, burrs or physical defects are present.

3.14.10 Safety: The valves and actuators shall be designed and constructed to provide safety for operating personnel.

3.14.11 Human engineering. The installation of components requiring adjustment, maintenance, or calibration shall be immediately accessible.

3.14.12 Drawings, calculations, product data, and manuals.

3.14.12.1 Drawings: The contractor shall prepare and submit 3 copies of the following drawings of the valves and actuators.

- a. Assembly drawings and schematics: These drawings shall provide complete Bills of Material, sufficient details, and assembly information for the end user to replace parts, or repair the valves and components. These diagrams shall serve as shop drawings for installation of the valves. Typical electric schematics should be included.
- b. Wiring drawing. This drawing shall show terminations, routing, and identification for all cables, wires, and connections. These diagrams shall serve as shop drawings for wiring of the system.

3.14.12.2 Calculations: Calculations and supporting information shall be prepared by the contractor to support the actuator sizing and disc connection analysis.

3.14.12.3 Manuals: The contractor shall prepare 3 copies of bound instructions on operation and maintenance of the valve and actuator. The manual shall include but not be limited to the following:

- a. Schematic diagrams (described above).
- b. Operating and maintenance instructions including lubrication, cleaning, and calibration instructions.
- c. Manufacturer's bulletins, cuts, and descriptive data on each piece of equipment.
- d. Parts list and recommended spare parts. The list shall give the manufacturer's name, part number, and a vendor for each item.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for tests. The vendor/manufacture shall be responsible for all testing of the valves and positioning systems. The vendor/manufacture shall perform all tests specified in 4.2.1.

4.1.1 The Government representative(s) shall have the option to witness the following tests at the contractor's facility:

- a. Valve operational tests.
- b. Valve seat leakage tests.
- c. Positioning system response tests.
- d. Hydrostatic tests.

During the test run the following data and observations shall be recorded:

- 1. Control operation
- 2. Voltages
- 3.. Currents
- 4. Speed and time
- 5. Alignment and operating clearances
- 6. Excessive vibration
- 7. Unusual sounds, malfunctions, or difficulties encountered ,and adjustments required.

4.1.2 Notification of factory test dates shall be given to the Government no less than two weeks prior to the test date.

4.2 Tests and verifications.

4.2.1 The vendor/manufacture shall prepare and submit a detailed test plan for all tests to be performed at his facility. The test plans shall be submitted no less than two weeks prior to notification. Not less than the following tests and verifications shall be included, performed, and documented.

4.2.1.1. Operational test: Perform a valve operational test. The operational test shall demonstrate valve actuation. The testing shall verify stroke times and shall demonstrate proper limit switch and torque switch operation. The valve shall be opened and closed six times prior to performing seat leakage test.

4.2.1.2 Seat leakage test: Perform a valve seat leakage test to demonstrate that the valves meet the requirements of the valve data sheets at the design pressure. The seat shall be tested dry (as installed condition) with no lubricant to aid sealing.

4.2.1.3 The valves shall be hydrostatically tested in accordance with ASME Section IIX, division I.

4.3 Quality conformance inspections.

4.3.1 The vendor/manufacture shall prepare and submit test reports on all tests and verifications done in 4.2.1. The personnel conducting the test and those approving the results shall sign these reports.

4.3.2 Inspect all welds in accordance with ASME Section IIX, division I.

5. PREPARATION FOR DELIVERY

5.1 The vendor/manufacture shall provide all preservation, packaging, and packing to assure safe delivery of the valve systems to AEDC.

6. NOTES - Not applicable.

7. APPENDICES

7.1 Valve data sheet.

APPENDIX 7.1

Valve Data Sheet

TABLE 7.1

TAG NO.	NO. 001
SERVICE	Air
SIZE (Inches)	66 Inch I.D.
TYPE	Double Offset Butterfly
END CONNECTIONS	Flange
ACTUATOR TYPE	Electric Motor
DESIGN TEMP.	-35, +400°F
DESIGN PRESSURE	0-150 psia each direction
SEAT LEAKAGE	Class V (each direction)
MATERIAL	SST
AXIAL FORCE	1000 Lbs
TORSIONAL FORCE ABOUT AXIS	153,800 Ft-Lbs
SHEAR FORCE	45,000 Lbs
INSTALLATION POSITION	Horizontal
OVERALL LENGTH	31.89 In.
ENVIRONMENTAL CONDITIONS	Outside Service

